

SIGNALLING RECORD SOCIETY (VICTORIA)

SOMERSAULT

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Dead line for July 1982 issue is 20 June 1982.
NEXT MEETING: 21 May 1982.
VENUE: A.R.H.S. Library Room, Windsor Railway Station.

Minutes of March 1982 General Meeting

HELD AT: A.R.H.S. Library Room, Windsor Railway Station. Meeting commenced
at 2044 hours.

PRESENT: J.McLean (Leader), G.Inglis (Minutes Secretary), D.Langley (Editor &
Archivist), J.Brough, R.Jeffries, J.McCallum, S.McLean, P.Miller,
C.Rutledge, J.Sinnatt and R.Smith.
A welcome was extended to visitors Brad Wooding, Greg Price and
Ray Sleightholme. Apologies were received from Wilfrid Brook and
Alan Jungwirth.

MINUTES OF PREVIOUS MEETING: adopted as read. (Inglis/Langley)

BUSINESS ARISING: Subscriptions for 1982 were set at \$5 Australian and \$12 for
combined Australian and UK membership.

CORRESPONDENCE: From Bob Taaffe regarding the North Coast CTC - work pro-
gressing steadily with crossing loops gradually being con-
verted to local control panel operation but still MES between
stations - Mindaribba, Paterson and Martins Creek done so
far. Progress reports will continue in future issues.

GENERAL BUSINESS: 1. Irish derailment - a query was raised whether the VR will
receive an official copy of the investigation report.
2. Diggers Rest - earlier this evening (Friday, 19 March) an
up train managed to smash through the level crossing gates
seriously delaying rail traffic. No injuries to cars or by-
standers were incurred.
3. Ashfield NSW - The SRA was lucky earlier this week when
a suburban train was derailed and was then run into by
another suburban train running in the opposite direction on
the adjacent track. No deaths but several serious injuries.
4. Franklin Street - Instructions have been issued concerning
the total occupation on Sundays to allow track centres to be
adjusted. This is necessary before the new Com-Eng suburban
trains (nicknamed the "Fat Trains") will be permitted to work
the Western suburban lines. The Sunday service of electric
trains now operate via suburban goods lines from Viaduct Jcn.
to South Kensington or Kensington with a substitute service
serving Spencer Street and North Melbourne. These services
were scheduled to be four car trains of PL cars with a "Y"
class diesel electric loco on either end. These are now run
by buses owing to the expensive crew rostering required even
allowing for two drivers and one fireman for each train.
The works is expected to be spread over about 18 weeks.
5. NSW Daylight Saving - Because of a NSW Government decision
to extend daylight saving in that state until the end of
March, various operational problems have arisen. Southbound
passenger trains are altered to depart Sydney later whilst
Northbound trains are reaching Sydney up to one hour later
than scheduled. Another interesting connection has surfaced
being the 1235 hours Melbourne to Albury passenger train due
to arrive Albury at 1615 hours (EST) with the Northbound Mail
scheduled to depart at 1630 hours (EST). With the arrival
time at Albury of the Victorian train being erratic it is
presumed that the Mail is held for the connection.

SYLLABUS ITEM: Members and visitors enjoyed watching a series of slides on

SIGNALLING ALTERATIONS

- 2-11-1981 MIDDLE CREEK & DEEP LEAD were disestablished as interlocked switching electric staff stations. The interlocking machines and all signals were subsequently removed. It is expected that the staff exchangers and signal replacers will be used at the staff stations on the Geelong-Ballarat line with Gheringhap the first station to be so equipped.
- 23-11-1981 SUNBURY. An annett locked crossover was provided leading from the down line to the centre road at the down end of the station. This has been installed to facilitate the termination of the local Sunbury trains which commenced running on 4 October 1981.
- 26-11-1981 RINGWOOD. L855 was moved 3 metres further out from the track. L927 was moved 8 metres in the down direction and 4 metres out from the track.
- 28-11-1981 FLINDERS STREET. U321 home signal was provided at "D" Box and controls the exit from the City Circle Underground Loop.
- 29-11-1981 WERRIBEE. Post 4 has been moved 15 metres in the up direction.
- WN50/1981 The last Weekly Notice for 1981 is No 50 and the first for 1982 is No 3.
- WN3/1982 UNDERGROUND LOOP HEAD SIGNALS. Three white lights at the top or a white disc with two vertical red bars is to be displayed by all suburban electric trains that will pass through the Loop tunnels.
- WN3/1982 LARA. New instructions have been issued for the switching out of the control panel at Lara. "Before panel is switch out, the Block Clear Lights for the West line Little River-Lara and for the East line Corio-Lara must be displayed. Illuminated letter "A" lights will be displayed on Post 2 (down home signal) and Posts 16, 20 and 22 (up home signals).
- WN3/1982 MINYIP. The facilities to establish Minyip as a temporary staff and ticket station have been removed.
- 2-12-1981 BORONIA. Pedestrian boom barriers working in conjunction with the Boronia Road boom barriers were provided.
- 6-12-1981 DANDENONG. Post 75, up home signal, has been relocated to a ground mast.
- 8-12-1981 WEDDERBURN JUNCTION. Closed as an electric staff station, the new section becoming Inglewood-Korong Vale "A". The train staff for the branch line to Wedderburn was also withdrawn and the line became part of the electric staff section, any train working the branch retains possession of the staff received at Inglewood or Korong Vale. The staffs are engraved Inglewood-Korong Vale "A"-Wedderburn. The signalling at Wedderburn Junction has been retained together with the auxiliary frame controlling the branch line junction.
- 13-12-1981 MORDIALLOC. The interlocked gates and gate stops for No 4 road were removed. Levers 52, 53, 54 and wheel 57 were removed from the interlocking machine. Lever 54 and gate wheel 57 - formerly used for the gates across the main line - were replaced by lever 55 and gate wheel 56.
- 15-12-1981 TRARALGON. Bracket signal Post 12 has been relocated to the opposite side of the line. Post 12 carries the signals applying from No 1B road into Traralgon yard.
- 16-12-1981 CAMPERDOWN. Flashing lights have been provided at Micklejohn Road level crossing and are automatic for up & down movements. The loop siding on the down side of the crossing is now secured by annett locks and a staff/annett key exchanger has been provided. Post 7 down home light signal has been provided to prevent unnecessary operation of the flashing lights and is worked by push buttons located at points "G" and "H", and also on the platform.
- 22-12-1981 LINDENOW. Closed as an electric staff station, the new section becoming Fernbank-Bairnsdale. The signals and plunger locks have been retained for the time being.
- 19-1-1982 SOUTH GEELONG. As part of the provision of an engine run round loop on the site of the loop removed on 29 September 1959. No 10 points were spiked normal, No 14 points provided with an annett lock while No 9 (FPL) became a pilot lever. The top arm on Post 3, the right hand arm on Post 4 and the discs on Posts 3 & 3A were removed. Levers 4, 10, 12, 14, 15 & 16 sleeved normal.

- 21-1-1982 YARRAM. The annett lock on the up end points was removed together with the up departure home signal and annett locked lever on the platform. The points are now secured by a hand locking bar.
- 26-1-1982 ST KILDA LINE. New signalling diagram No 4/81 was issued replacing diagram No 13/52. The principal alteration on this diagram and most of the others reissued at about this time, is the renumbering of certain signals in association with the provision of the METROL signalling centre.
- 26-1-1982 PORT MELBOURNE LINE. New signalling diagram No 14/81 issued replacing diagram No 6/71.
- 27-1-1982 JOLIMONT-MERRI. New signalling diagram No 17/81 issued replacing diagram No 4/76.
- 27-1-1982 SOUTH YARRA-MALVERN. New signalling diagram No 22/81 issued replacing diagram No 17/73.
- 28-1-1982 EAST RICHMOND-EAST CAMBERWELL. New signalling diagram No 15/81 issued replacing diagram No 23/80.
- 1-2-1982 PERMANENT WAY SIGNALS. The "NS" board previously used for suburban electric trains and parcels coaches is now to be used for the following types of trains throughout Victoria - Country passenger trains with seven vehicles or less, suburban electric trains, parcels coaches, light engines and Bonas. The "NS" board is a yellow sign with black letters. The "N" board - a white sign with black letters - will continue to be used and will apply to all other trains. The Engineman may increase the speed of their train when the engine has reached the "NS" board or when the guard has advised by radio that the van has passed the point of restriction in the case of extremely long trains.
- 10-2-1982 TALLYGAROOONA. Closed as an electric staff station the new section becoming Shepparton-Numurkah. The signals and plunger locks have been retained.
- 10-2-1982 SYDENHAM-GISBORNE. New signalling diagram No 41/81 has been issued and it replaces the following diagrams - No 3/48 Sydenham, No 17/40 Sunbury and No 15/28 Diggers Rest.
- 12-2-1982 EUROA. The staff locked points that had been previously spiked normal were removed.
- WN9/1982 PERMANENT WAY SIGNALS. The "NS" board has been changed to a white board with black letters. In addition to give engineman earlier warning of the speed over a certain section of track ahead, the temporary speed limit in kmph will be displayed on both the Warning and Caution Boards.
- 12-2-1982 PLINDERS STREET "C" BOX. New signalling diagram No 1/82 was issued replacing diagram No 34/81. The lead from No 5A road to the Burnley local lines and the lead from No 5 road to the Caulfield local lines was abolished. Points 100 & 102 were provided with electro-pneumatic clamp locks, points 122 & 127 were spiked normal and the up end of points 126 was spiked reverse. Levers Nos 95, 97, 103, 123 & 125 became pilot levers. Levers Nos 112, 118, 133, 140 & 144 (signals), 122 & 127 (points) and 92 & 119 (pilot levers) were sleeved normal.
- 14-2-1982 MOOROOLBARK. Post 6 was moved 32 metres in the down direction whilst Posts 9 & 10 were moved 6 metres in the same direction.
- 23-2-1982 SPRINGHURST. Existing Post 6 was renewed as a straight mast.
- 24-2-1982 BET BET. All signals and points were abolished.
- 26-2-1982 PLINDERS STREET "B" & "C" BOXES. New signalling diagram No 4/82 was issued replacing diagram No 1/82. Signal 738 was relocated 20 metres in the up direction and posts 75, 76 & 176 at "B" Box were abolished. The following controls were transferred from "C" Box to "B" Box and indicated on the diagram - signals Nos 580, 585, 586, 733, 736, 737, 738, 747, 901, 902, 903, 907 and 909, points Nos 480, 634, 636, 639, 643, 645, 647, 648, 800, 802 and 807, control levers Nos 578 for No 5A road, 584 for No 6 road and 734 for No 7 road.
- 28-2-1982 GBEELONG "A" BOX. Post 58 was removed from the overpass and placed on a ground mast.

SINGLE LINE AUTOMATIC SIGNALLING
(THE ABSOLUTE PERMISSIVE BLOCK SYSTEM)

by John P. Sinnatt.

SINGLE LINE SECTIONS

1. Introduction.

In Victoria there are, or have been, single line sections equipped with three-position signals of the semaphore, three aspect light and search-light types. Intermediate signals may be normally off in both directions, normally at stop, or normally off in one direction or the other. Departure signals may be cleared locally by a signalman, remotely by a Train Controller or automatically by the approach of a train; local clearance may be subject to control by the signalman at the distant end. Operating rules may be those of the Automatic and Track Control, Centralised Traffic Control, or Lever Locking and Track Control systems. Yet with one important exception (and this dates only from 1981) all single line signalling on the Victorian Railways derives from the General Railway Signal Company's Absolute Permissive Block (APB) system of 1911 in which all signals including the Departures were normally at proceed. The exception is the Melbourne Underground Rail Loop where special considerations apply.

These notes set out to explain how the signals work in the various versions of the APB system used in Victoria, together with some used elsewhere and to show how, in spite of outward differences, each is derived from the basic system of 1911. Certain conventions will be adopted in the descriptions for the sake of uniformity and to facilitate comparison. Most of the versions are described with reference to a notional single line section with Departure and Arrival signals at each end and two pairs of intermediate Automatics. The direction from left to right is regarded as "down" and the opposite direction as "up". The down signals are numbered 1, 3, 5 and 7, and the up signals are 2, 4, 6 and 8. These are for reference purposes only and there is no suggestion that they represent lever numbers. The signals are drawn on the left hand side of the line even where the original American system is being described. The three positions of an upper quadrant signal are referred to as Stop, Warning and Proceed; the term "clear" means not at Stop. In the progress of a train through a section, the front is the "engine" and the rear is the "van".

As the intention of the notes is to explain how the signals work, technicalities cannot be avoided, but generally a non-technical account of the outward behaviour of the signals in each version is given first. Electrical circuits have been introduced where necessary to facilitate explanation; these are drawn in simplified form to show which contacts control which relays or signal mechanisms, and may be referred to as "control diagrams". It is expected that the diagrams will be understood by members of the Signalling Record Society.

2. The Directional Stick Relay

2.1 Need for Directional Control

Automatic signalling originated in the United States of America. Provision of automatic signals on double or single lines enabled following trains to run at closer intervals than the five minutes allowed by the rules in the early years - later generally extended to ten minutes.

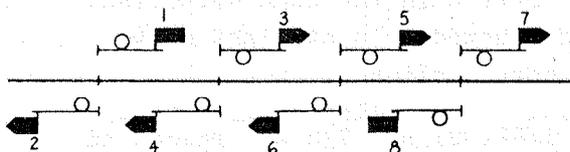


Figure 1.

If the controls on signals on single lines were based on the requirement for spacing following trains, then in Figure 1, signal 1 would control to signal 3, signal 3 to signal 5 and signal 5 to signal 7, thus when an up train passed signal 8, signal 5 would go to Stop and signal 3 to Warning. Signal 1 would remain at Proceed at this stage and would not finally go to stop until the train passed signal 4.

It was theoretically safe for Departure signals 1 and 8 to be normally at Proceed as shown because the signal indications did not supersede the superiority of trains as prescribed by the rules of the American Timetable and Train Order system, and a train was not permitted to accept a clear Departure signal unless it had the right to occupy the section. Nevertheless it is obviously desirable that a train entering a section from one end should immediately put back the Departure signal at the other end. In a practical system this means putting back the intermediate signals also. What is wanted in a fully automatic single line system is for signals 1, 3 and 5 to clear in succession as the van of a down train passes the next signal ahead, but for all to go to Stop as soon as an up train passes signal 8. The controls are then different for the two directions of traffic so the signals have to know which way the train is going. - This is usually determined by means of directional stick relays.

2.2. The TDB Stick Relay

A stick relay is not one of special construction but one whose circuitry allows it to pick up through one set of contacts and then hold up or "stick" through one of its own contacts even if the pick up circuit is broken. The relay drops when a different set of contacts are broken. A simple example is a relay which picks up and stays up when a "start" button is pressed and released, then drops and stays down when a "stop" button is later pressed and released.

When a stick relay is used in single line railway signalling the pick up circuit is made only when the train is travelling in a particular direction, a separate relay being provided for the other direction. Probably the first application to fully automatic signalling was in the Union Switch and Signal Company's Traffic Direction Block system. This was a.c. operated and intended for use principally on electric interurban railways in the USA where the track circuits should desirably be a.c. fed. The system was devised in the years following 1905 by which time a.c. signalling technology had been virtually fully developed.

The section between passing sidings is divided into two track circuits with a common feed in the centre (no insulated joints) and relays at the outer ends, as in Figure 2. One pair of intermediate signals is provided, staggered with respect to each other. The staggering is required because the absence of insulated joints at the centre means that the two track circuits overlap somewhat such that 1T effectively extends to signal 4 and 6T effectively starts from signal 3. All four signals are fully automatic in operation and all are normally clear. Signal 6, as well as signals 1 and 4, goes to Stop when a down car passes signal 1, but signals 1 and 4 clear again as soon as 1T is vacated. Similarly, signal 1 goes to Stop when an up car passes signal 6, thus signal 1 is at Stop or clear when 6T is occupied depending on whether the car is an up or down.

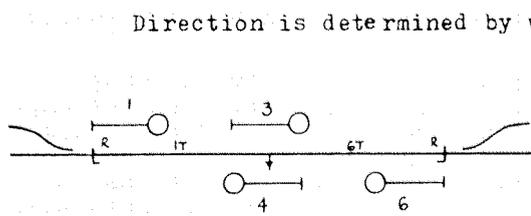


Figure 2.

Direction is determined by which of the two track circuits is entered first. If 1T is occupied while 6T is clear, the down stick relay picks up and stays up even after 6T is entered and 1T is vacated until 6T is clear again. Similarly the up stick relay is operated for the whole time an up car is in the section. Only one stick relay can be energised at the same time and each Departure signal proves the opposing stick relay down. Signal 1 requires 1T clear and either 6T clear or the down stick relay operated, whilst signal 6 requires 6T clear and either 1T clear or the up stick relay operated. Thus a down car entering 1T will put signal 6 to Stop because the up stick relay will not be operated.

The Traffic Direction Block system was installed in 1910 on about 150 kilometres of line of the Illinois Traction System. It does not, however, appear to have come into widespread continuous use afterwards even though it could have been adapted for d.c. operation on non-electrified lines. Possibly the reason was that the TDB stick relay circuit was not well suited to applications where more than one intermediate signal was required whereas the APB stick relay catered for this condition admirably. The principle of the TDB stick relay was, however, widely used in later years for controlling Flashing Light signals at single line level crossings. A contact on the down stick relay is used to bridge round the up approach track and vice versa, so that the lights stop as soon as a train clears the crossing. Thus the TDB principle became of more importance in the control of roadway signals than of railway signals.

2.3. The APB Stick Relay

In the General Railway Signal Company's Absolute Permissive Block system, first installed in 1911 on a section of the Toronto, Hamilton and Buffalo railway in Canada, a directional stick relay is provided at each intermediate signal. The relay at a down signal operates only for down trains and the one at an up signal only for up trains. As many signals can be provided as are required for traffic purposes.

As shown in Figure 3, the section between signals is divided by insulated joints into two track circuits with the relays installed at the signal locations. The stick relay at signal 3 picks up during the short interval between a down train entering 3T and the signal arm falling below 40 degrees. The stick relay stays up until the signal's control relay picks up again after the train passes signal 5. For an up train, signal 3 will be at Stop before 3T is entered so that the stick relay will not pick up. Similarly the stick relay at signal 6 will operate only for an up train and not a down. The function of the APB stick relay in the complete system is explained in section 3.

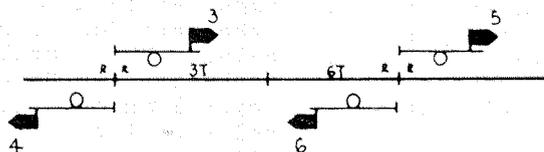


Figure 3.

3. Departure Signals at Proceed

Figure 4 shows a section of line between two passing sidings (crossing loops) signalled in accordance with the original Absolute Permissive Block

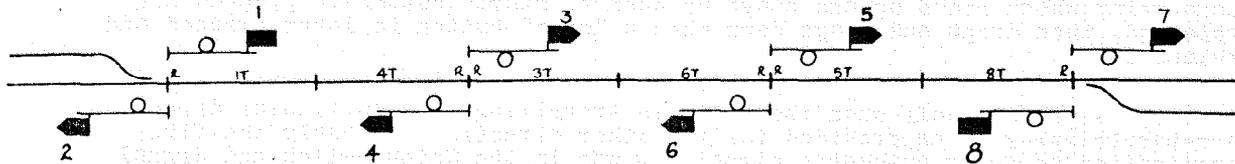


Figure 4

system with Departure signals at Proceed. The relay at each signal for controlling the semaphore mechanism is designated - GR (siGnal Relay) - and to be operated, firstly requires the track circuits as far as the next signal to be clear, in addition, signals 1 and 3 require either the GR or SR (StiCk Relay) of the next signal to be operated. Signal 5 does not require this additional control because an up train may legitimately be ahead of signal 7. Controls for the signals in the opposite direction are similar. Normally all the GRs are operated.

Consider now the effect on the down signals of an up train passing signal 8. As previously explained, the SRs at signals 3 and 5 - designated 3SR and 5SR - pick up only for down trains so that they remain unoperated for up trains, thus when an up enters 8T and 5GR drops, relays 3GR and 1GR drop in turn (or "cascade" as the signal engineers say) and signals 5, 3 and 1 go to Stop in quick succession. When the van passes signals 5 and 6, 5GR picks up again and signal 5 clears again. Similarly when the van passes signals 3 and 4, and 1 and 2, signals 3 and 1 clear again provided that a second up train has not entered the section.

Now consider the passage of a down train. When this train passes signal 1, signals 6 and 8 as well as signals 1 and 4 go to Stop. When the engine passes signal 3, 3SR picks up so that when the van passes, 1GR will pick up and signal 1 will clear again even though 3GR is down. When the van passes signal 5, 3GR picks up (and 3SR drops) enabling signal 3 to clear, signal 5 clearing in the same way when the van passes signal 7, thus the down automatics act as block signals for spacing down trains but all go to Stop together when an up train enters the section.

One safeguard remains to be mentioned. If 3SR or 5SR remained energised wrongly for any reason after a down train cleared the next signal, although 3GR or 5GR pick up again, a dangerous situation would occur if the next train was an up. With 5SR up, signal 3 would not go to Stop when the up train passed signal 8 and signal 1 would also remain off. For this reason, 8GR proves 5SR down, 6GR proves 3SR down and 4GR proves 1SR (if provided) down. Similar controls apply for the other direction. This means in effect that before signal 8 will clear behind an arriving train, all the opposing SRs must have dropped out.

No additional line wires need to be run to convert ordinary double line signals to APB signals, only two pairs of wires are required - one pair for the signals in each direction. A common return is often used with d.c. signals reducing the total number of line wires to three but the system is still generically referred to as a "four-wire" system. Another point to notice is that any number of intermediate signals can be provided.

These features no doubt accounted for the great popularity of the APB system. By 1916, only five years after its introduction, no fewer than 3700 kms of track on steam or electric lines in the USA and Canada had been equipped, including 1010 kms. on the Northern Pacific Railway and 130 kms. on the Union Traction Company of Indiana.

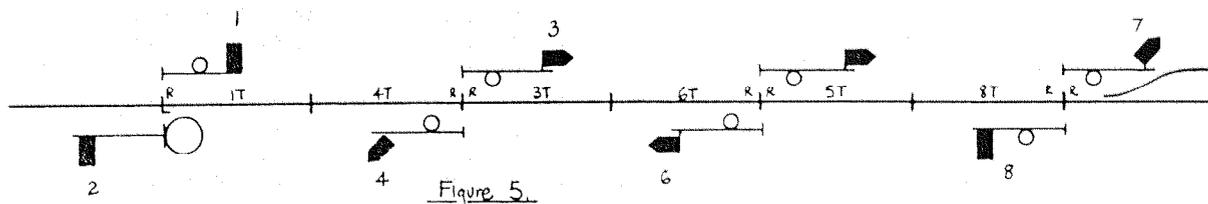
4. Departure Signals at Stop

The Absolute Permissive Block system was first installed in Australasia in 1921 on the Upper Ferntree Gully - Belgrave section of the Victorian Railways' narrow gauge line to Gembrook which then carried heavy holiday traffic. Although the section was only 5.6 kms. in length, running time was about 30 minutes and the intermediate station at Upwey was signalled as an unattended crossing loop. Longer sections were equipped within the next few years in South Australia, New South Wales (Molong-Dubbo) and New Zealand. The installations in Australasia differed from those in North America in having the Departure signals normally at Stop. At an attended station, the signal was controlled by a lever; at an unattended station it cleared automatically on the approach of a train. Stations or loops of this latter type will be described in the section dealing with Unattended Hand Operated Crossing Loops.

In the Victorian system as with others in Australia (but not in New Zealand), the system used low-voltage d.c. apparatus powered from primary cells the signals being oil-lit. If signals are to be electrically lit from primary cells, approach control of the lighting is generally considered desirable to prolong battery life; an interesting and probably little known former example of approach lighting of battery powered signals in Victoria will be described in the section on Electric Staff Stations with automatic Signals.

Figure 5 shows a section of line between an attended station on the left and an unattended station on the right, both with Departure signals normally at Stop. Two pairs of intermediate automatic signals are shown to facilitate comparison of other versions of the APB system but only one pair were actually provided in the original VR installation.

Only minor modifications were required to the original (Departure signals normally at Proceed) system. 1GR and 8GR were still normally operated, the lever or approach clearing controls being applied direct to the mechanism circuit. This arrangement enables an indicator to be provided, activated by a



contact on 1GR, to show the signalman when the track is clear and no opposing train is in the section. In a battery operated system the indicator is a disc showing "track clear" or "track occupied", but in an a.c. system a light glows to show that the track is clear. This is sometimes referred to as the "block light". A contact is also included in the mechanism controls which breaks when the Pilot Staff (Pilotman's Key) is withdrawn to secure the signal at Stop during emergency working.

The only other essential modification is that the control of 5GR is taken through a contact made when the arm of signal 8 is at Stop. Now signals 5 and 3 go back to Stop and signal 1 is held at Stop by the cascade of GRs when the arm of signal 8 starts to rise, rather than not until the train passes the signal. Provision of the arm contact means also that if signal 1 is to be cleared when the whole single line section is unoccupied then because no stick relays will be operated, 1GR requires 3GR up which requires 5GR up which now requires signal 8 at Stop. So before a Departure signal will clear the opposing Departure signal must be at Stop. This great improvement was achieved without the running of any additional line wires. A further point to note is that when the indicator at the attended station shows "track occupied" after signal 8 has been cleared for an up train, operation of the lever will have no effect on the up signals - because signal 1 will not clear, signals 4, 6 and 8 will remain off.

With the Departure signals normally at Stop, Absolute Permissive Block could become a suitable safeworking system for those railways which had previously followed the British practice of staff or tablet working. However, an Order of some type would have to be given to crews of trains which were to cross at an unattended station unless explicit instructions were laid down in the working timetable or elsewhere so that they would know which track to take and how many trains to wait for while there. In Victoria APB was known as Automatic and Track Control system and rules covering the Upper Ferntree Gully to Belgrave installation are included under this heading in the 1928 General Appendix. Reference was made in these to the "schedule instructions" about which road a train was to take on arrival at Upwey for a cross. The same Appendix states that the Train Section Order system also applies. This suggests that all trains had to carry a Section Order whether or not they were to cross at Upwey. The automatic system was abolished in 1930 along with the Section Orders and Upper Ferntree Gully-Belgrave became a single Train Staff and Ticket section.

One pair of intermediate automatics were installed on the single line between Goulburn Junction and Seymour when remote control of the junction was installed in 1925 (see Jan/Mar 1980 issue of Somersault - page 8, fig 3). I would expect that these two signals were equipped with APB stick relays although I do not know for certain. (Perhaps some reader who has access to the "morgue" would care to look this up.) A much earlier article in the "Victorian Railways Magazine", January 1927, includes a description of the power supply arrangements and this is worthy of note.

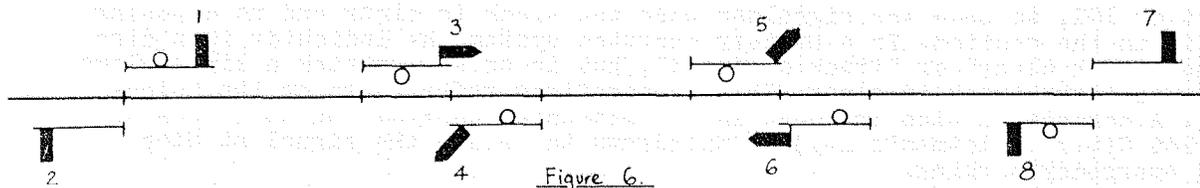
Low voltage d.c. signalling apparatus was still used (two-volt track circuits, 10v line relays and signal mechanisms, and 20v point machines) but energy was now obtained from secondary cells trickle charged by rectifiers fed from a.c. mains. Alternating current at 230 volts (then the standard voltage in

Victoria) was supplied by the Seymour Council's generating station and transmitted by two insulated cables in trunking from Seymour "A" to the Junction and thence to Tallarook on aerial wires. The advantage of installing trickle charged or floated secondary batteries is that these can carry the load for some hours in the event of the mains supply failure.

This general method of power supply is commonplace nowadays being virtually essential for Flashing Light signals at level crossings. (It is essential at any location equipped with electronic apparatus in order to suppress power spikes in the supply current.) It is also used for the railway signals on the North Eastern Standard Gauge line (1962) but it would have been quite novel in 1925 and this may well have been the first important installation on the Victorian Railways. A point that puzzles me is what type of rectifier was used. Were copper/copper oxide rectifiers commercially available in 1925? Some railways used a "mechanical" rectifier, probably a type of synchronous vibrator. One would not expect thermionic valve rectifiers to be installed in trackside boxes. Perhaps plans in the "morgue" would clear up this point.

The older method of power supply from primary batteries was reverted to in the Castlemaine-Maldon Junction remote control installation of 1926 and presumably the signals (upper quadrant) were fitted with oil lamps. I do not know whether this reversion was in any way significant.

In most illustrations in these notes the up and down signals are shown in pairs opposite each other as this is the general practice in Victoria. However, other states may prefer their signals to be staggered as in Figure 6 and this appears to be the case particularly with South Australia. Where the



signals are staggered, the ones for the opposite direction behave differently when a train runs through than where the signals are opposite. It has been explained that with the paired arrangement 1GR proves 4SR down and 3GR proves 6SR down, but with the staggered arrangement it is more convenient for 3GR to prove 4SR down and 5GR to prove 6SR down. Thus when an up train proceeds, signal 5 remains at Stop until the van passes signal 4 because 6SR does not drop until point, similarly, signal 3 remains at Stop until the van passes signals 1 and 2. Of course if signal 8 was cleared again for a second train soon after the first passed signal 6, signals 5 and 3 would remain at Stop even longer. A former example of staggered signals in New South Wales will be shown in Figure 12.

(to be continued)

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Society News

In the last issue of Somersault the page numbers were incorrectly marked and the necessary alteration is as follows - former pages 2, 3 and 4 become pages 8, 9 and 10.

In response to the plea at the annual meeting for 'something to print' in Somersault, the result was staggering - just one. Graeme Reynolds has forwarded some more information he has gathered on Winter's block and the results of his labours appear in this issue. In the section on Victoria is an incomplete list of Victorian block sections and any members who may have some additions to this list are urged to send them to either Graeme or myself for inclusion in a future update article. Some of the sections mentioned do not give details of the intermediate block posts and this we would like to remedy, also any details of the provision of switches at the block posts would be welcome.

The Society has some spare English Newsletter which are now offered for sale to anyone who would like them. The cost of each issue is \$1.20 and this includes postage. The issues available are: January 1980, May 1980, July 1980, May 1981, July 1981, September 1981 and November 1981. Features in these issues include Around the Centres - Bradford, GWR signalbox types (Jan 1980), around the Centres - Birmingham Pt 1, GWR signal boxes - timber types, Lochem - A Dutch single line crossing station (May 1980), Around the Centres - Hull Springhead, Namesakes No 4 - Park Junction (July 1980), Around the Centres - Birmingham Pt 3, Manorowen - Top of the Bank, The Waterloo and City Railway in 1980 (May 1981), Around the Centres - Llandudno Junction, Signalboxes I have known (A.Vaughan) - Uffington (July 1981), Around the Centres - Houston USA, Uffington Pt 2 (September 1981), Around the Centres - Houston USA Pt 2, New station at Blaenau Festiniog (November 1981).

WINTER'S BLOCK TELEGRAPH

by Graeme Reynolds and Don Martin.

Since the publication of the article in Somersault Vol 4, No 1, further details of the use and application of this patent have been obtained. Much of the detail is supplementary but it does modify some of the previously suggested theses.

1. Victoria

The Balaclava line is acknowledged to have been the initial installation but C.D.Gavan Duffy in Bulletin (1961) nominated that date as 15 October 1883. Somersault Vol 3, No 2 reports it as 3 October 1883. However, it has been suggested by Alan Jungwirth that the actual date is earlier still. In an article pertaining to the introduction of block working, Argus (9 October 1883) stated that,

'The Railway Department has completed the trials and experiments which have been proceeding during the last few months in connection with the block system, and a large number of the employees on the south suburban lines having been carefully instructed in the use of the blocks it has been decided to introduce the system on Monday next, the 15th instant ...'

Reference was also made to the 'present intention' to equip twenty of the south suburban and Gippsland stations, as well as the extension 'by degrees', of the system to the whole of the stations on the Victorian Railways.

This item does indicate the use of the patent for trials prior to October 1883, but it does also support the 15th as the planned date for the introduction of regular workings. On that date a greatly increased train service on the Hawthorn and Brighton lines was introduced in conjunction with the alterations to the use of the platforms at Flinders Street and Princes Bridge stations. It would seem that these arrangements could have been closely associated with the introduction of a block system.

In 1886, Winter's block telegraph was provided at South Geelong, which was an intermediate station in the Train Staff and Ticket section Geelong-Queenscliff Junction. This safeworking arrangement enabled a train to stand at South Geelong, rather than at the Staff station until 'Line Clear' could be obtained from the station in advance. By 1899, South Geelong had four signals, the two starting signals being used in connection with the block working. It is understood that there was no electrical arrangement between the block instrument and the signal as had been outlined in the patent.

The practice of using block telegraph to protect a select piece of track within a Train Staff and Ticket section has been found in a number of other locations:-

Beaufort-No 30 Gate-Middle Creek
Benalla "B"-Winton-Glenrowan
Hallam Road-Warre Warren-Berwick
Great Western-No 68 Gate-Stawell Booking Office

In the early years of this method of working, it seems that the block telegraph working was more likely to be only between the block post and the staff station in advance. Such an arrangement would have been only required for trains following at a headway shorter than the length of the Staff section. The presence of a steep grade in each of these sections would have led to additional delays for following traffic, so that the use of the block post would have considerably lessened these delays.

Gavan Duffy in Bulletin (1945) mentioned that the Station Master at Winton had to watch for approaching Down traffic from Benalla. This suggests that the Block was provided only between Winton and Glenrowan. This would have meant that a train climbing Glenrowan bank would have been protected by the block. Keith Turton (1973) suggests that the block post was probably opened for the running of two up trains at a shorter interval than the Staff section would have permitted. If the block were not connected to Benalla, it would be apparent that it would be assumed that the first train had ample time to reach Benalla before the second train had gained much distance on it.

Later developments in this practice for safeworking at these block posts indicates that block working was provided at all stations on the staff sections. A well known example of this was the narrow gauge line from Upper Ferntree Gully to Gembrook. E.A.Downs (1963) stated that Winter's block was provided by 1907 at the block posts - Belgrave, Aura, Emerald and Cockatoo, which were in the one staff section Upper Ferntree Gully-Gembrook. General Appendix (1913) stated that certain block posts could be opened as Temporary Staff Stations, whilst General Appendix (1919) listed more detailed instructions for the safeworking from Upper Ferntree Gully to Emerald.

That section could be divided by up to four Block posts for Ticket working or by the opening of up to two temporary staff stations with the option of adding block posts. All locations, including Gembrook, the terminal station, were equipped with winter's block.

It is worth noting that the line as far as Belgrave was converted to Automatic and Track Control on 22 December 1921 to cater for the heavy traffic of excursion trains.

Jack Mclean and David Langley have forwarded some details of the dates of installation of winter's block on the lines of the Victorian Railways, together with some details which have been published in a number of articles and lineside guides, and merit publication. The following list is not complete and additional details are welcomed.

Line	Date
Fishmarket/Princes Bridge-Balaclava	3 October 1883 or 15 October 1883
Warrenheip-Ballararat East	24 April 1884
Spencer Street No 1 Box-Franklin Street Box	pre 3.4.1885
Franklin Street Box-Coburg line	pre 3.12.1885
South Yarra-Caulfield	pre 3.12.1885 Note 1.
Leigh Road-Lethbridge	pre 3.12.1885
Meredith-Lethbridge (up line)	pre 3.12.1885
Yendon-Warrenheip	pre 3.12.1885
St Kilda line	9 February 1886
Flinders Street-Graham Street	12 February 1886
Lydiard Street-North Ballarat Junction	pre 1.7.1886 but possibly 22.3.1886
Beaufort-No 30 Gate-Middle Creek (single)	1 March 1886
Elphinstone-Castlemaine	pre 1.4.1886 Note 2.
Footscray-Williamstown Pier	12 April 1886
Essendon-Wandong Ballast Pits	15 June 188
Geelong-South Geelong-Queenscliff Junction (s)	pre 1.7.1886
Wandong Ballast Pits-Seymour	12 July 1886 Note 3.
Seymour-Mangalore (single)	23 July 1886 Note 4.
Kew Junction-Kew (single)	1887
Benalla "B"-Winton-Glenrowan (single)	9 December 1887
Caulfield "B"-Rosstown-Murrumbeens-Oakleigh "A"	18 January 1888
Camberwell-Canterbury-Surrey Hills-Box Hill	9 December 1888
Williamson's Street Box-Cattle Siding	1888
Melton-Parwan-Bacchus Marsh (single)	12 June 1889
Waverley Road-Oakleigh "A" (single)	possibly 24.3.1890
Camberwell-Riversdale	30 May 1890
Clifton Hill-Heidelberg (single)	25 June 1890
Woodend-Elphinstone	prior to 1892, (suggested date is 21.1.1891)
Dandenong-Great Southern Junction (single)	15 July 1891 Note 5.
Oakleigh "B"-Clayton-Springvale-Dandenong "A"	14 December 1891
Flinders Street "A" Box-Viaduct Junction	about 10.10.1894
Eaglehawk-Kerang Junction (single)	19 May 1895 Note 6.
Bendigo "A" Box-Bendigo "B" Box	29 August 1899 Note 7.
Hamilton-Coleraine Junction (single)	31 October 1901
Upper Ferntree Gully-Gembrook (single)	February 1907
Mordialloc-Aspendale-Carrum-Frankston	1 December 1910
Castlemaine "A"-Castlemaine "B"	May 1912
Westgarth-Fairfield Park-Alphington	8 December 1912
Drouin-Warragul	20 August 1950
Longwarry-Drouin	22 June 1952
Warragul-Darnum-Yarragon	6 October 1952
Hartwell-Ashburton	7 April 1954
Bayswater-Ferntree Gully	10 February 1957
Croydon-Wooroolbark	8 September 1957
Coburg-Batman-Pawkner	19 July 1959
Reservoir-Keon Park	29 November 1959

Notes

1. This installation would seem to have been part of the work mentioned in Argus (9.10.1883).
2. Chewton was a repeater block post only for down trains (i.e. Line Clear given to Elphinstone only when Line Clear received from Castlemaine) until 22 December 1927 when full block working was introduced together with additional signals.
3. This line was equipped with double line to Tallarook and single line from there to Seymour. The double line was extended to Goulburn Bridge on

18.10.1885 although Goulburn Bridge appears not to have become a block post until about June 1886.

4. This section was duplicated on 23 September 1889.
5. This installation only operated for one week during the rearrangement of trackwork between these places.
6. This block section was in operation only during the regrading of Catherine Bank and the junction of the Swan Hill & Korong Vale lines was moved out from Eaglehawk to the point of divergence.
7. Brought into service in conjunction with the provision of the present passenger lines.

The General Appendix (1888) and (1890) included lists of the block stations then equipped with Winter's block. These sources seem to have been the basis of Gavan Duffy's articles in Bulletin (1945-1946), but in these secondary sources the detail is not sufficiently clear for accurate dates of installation to be established. Some indication of the extent of the block working may be found in the Working Timetable (15 December 1896). This publication preceded by less than twelve months some large scale installation of Electric Staff and Electric Tablet which made inroads into the use of Single Line Block. Block Posts in 1896 were:-

Spencer Street - Echuca line (double line)

Spencer Street No 1 Box-Franklin Street-Coburg Junction-Brown's Hill Junction-Footscray Junction-Middle Footscray-Footscray West*-Braybrook Junction*-St Albans-Sydenham-Sunbury-Lancefield Junction-Riddell's Creek*-Gisborne-Macedon-Woodend-Carlesruhe*-Kyneton-Redesdale Junction*-Malmsbury-Paradale*-Elphinstone-Chewton(up only)-Castlemaine "A" Box*; Castlemaine "B" Box-Harcourt*-Ravenswood*-Kangaroo Flat*-Golden Square*-Bendigo "A" Box; Williamson Street Box-Cattle Sidings.

Branch lines from the Echuca line (single line)

Castlemaine "A" Box-Maldon Junction.

Daylesford-Leonard's Hill-Rocky Lead-Newlyn-Kingston-Allendale-North Creswick-Creswick-Waubra Junction-Macarthur Street Junction.

North Creswick-Tourello-Clunes-Talbot-Maryborough.

Braybrook Junction (Sunshine) - Serviceton line (single except where shown)

Braybrook Junction-Beer Park-Rockbank-Melton-Parwan-Bacchus Marsh-Ingliston-Ballan-Gordons-Wallace-Dunnstown-Warrenheip.

Warrenheip-Ballarat East; Lydiard Street Box-Macarthur Street Junc.-Scarsdale Junction. (double)

Beaufort-No 30 Gate-Middle Creek; No 68 Gate-Stawell Booking Office. (the last named section for down trains only)

Footscray Junction-Port Fairy line (double to Newport then single)

Footscray Junction-Yarraville-Spottiswoode-Newport; Lara-Nth Geelong; Geelong "A" Box (now "B")-South Geelong-Queenscliff Junction.

North Geelong-Warrenheip (double)

North Geelong-Moorabool; Gheringhap-Leigh Road*-Lethbridge-Meredith-Blaine-Lal Lal-Yendon*-Warrenheip.

North Eastern line (double to Mangalore then single)

Coburg Junction-Kensington-Newmarket (Note 1)-Ascot Vale*-Moonee Ponds-Essendon-Broadmeadows-Somerton-Craigieburn-Donnybrook-Beveridge-Wallan-Kilmore Junction-Wandong*-Kilmore East-Broadford-Fallarook-Goulburn Bridge; Seymour "A" (now "B") Box-Mangalore; Benalla "B"-Winton-Glenrowan; Wangaratta-Beechworth Junction; Chiltern-Barnawatha.

Branch line off the North Eastern line (single)

Everton-Beechworth.

Dandenong-Bairnsdale line (single)

Dandenong "B" Box-Narre Warren-Berwick-Beaconsfield-Pakenham-Nar Nar Goon-Bunyip-Longwarry-Drouin-Warragul-Darnum§; Moe-Morwell-Praralgon; Stratford Junction-Stratford.

§ - Block to Warragul not used for any extra trains running after the last up train at night until the first regular train next day.

Suburban lines (all double unless shown)

Flinders Street "A" Box-Ferrars Street Box-Graham Street.

Flinders Street "A" Box-South Melbourne-Albert Park-St Kilda.

Flinders Street "A" Box-Viaduct Junction-Spencer Street No 1 Box.

Coburg Junction-Macaulay Road-Royal Park-South Brunswick-Brunswick-Moreland-Coburg.

Royal Park-North Carlton-North Fitzroy; St Georges Road Junction-Middle Northcote.

Middle Northcote-Preston(Bell Street)-Preston(Reservoir). (single)

St Georges Road Junction-Clifton Hill-Collingwood. (single)

Newport-North Williamstown-Williamstown (Ann Street)-Will'town Pier.

Princes Bridge-Jolimont Junction-Richmond-South Yarra-Hawksburn-Toorak-Armadale-Malvern-Caulfield "A" Box*; Caulfield "B" Box-Oakleigh "A" Box; Oakleigh "B" Box-Springvale*-Dandenong "A" Box.

Caulfield "B" Box-East Brighton-South Brighton-Cheltenham-Mentone-Mordialloc.

South Yarra-Frahan-Windsor-Balaclava*-Elsternwick-North Brighton-Middle Brighton-Brighton Beach-Sandringham.

Richmond-East Richmond-Burnley-Hawthorn-Glenferrie-Auburn-Camberwell "A"; Camberwell "B"-Canterbury-Surrey Hills*-Box Hill-Blackburn-Mitcham-Ringwood.

Ringwood-Croydon-Lilydale. (single)

* - Block post which may be switched out.

Note 1. Newmarket Junction closes after the last pilot for the stockyards clears on Saturday until first train Monday.

2. Western Australia

Winter's block was provided between West Perth and Claisebrook (prev East Perth) in 1896 when the line was duplicated. By the end of the following year these instruments had been provided from Fremantle to Nineteen Mile Junction near Bassendean. In the Annual Report (1898) the Electrical Engineer stated that 'electrical blocking' of that line had been completed and switches had been brought into use to minimise the manning of block stations during light traffic. He also wrote that,

'the blocks have worked fairly well, but one or two defects have shown themselves, which I have in hand and hope to remedy completely as soon as I obtain the new instruments imported from England....'

It is not clear whether he referred to the importing of another batch of this patent or a plan to purchase another patent block. Minchin and Higham in Robb's Railway (ARHS Western Australian Division, 1981) suggest that between 1901 and 1905 three position instruments were provided between Claisebrook and Bellevue but they do not identify the patent. The Annual Report (1900) stated that 46 sets of two position instruments were in use but as renewals occur, 'more modern instruments' which displays three positions would be introduced. By 1911 Sykes Lock and Block had replaced Winter's on the Fremantle-Guildford line.

The imported instruments which are mentioned in 1898 might have been the complement of the 46 known in 1900, but it is not clear how they differed from the earlier batch, presuming that the Engineer in 1898 had not indicated an intention to purchase Sykes.

3. South Australia

The South Australian Railways has used the symbol 'B' in the Working Timetables to identify locations which were Winter's block stations. The Adelaide Division Metropolitan Passenger Services (7 June 1953) and Country Passenger Services (7 June 1953) show that Winter's block was in use on the double line from Glanville to Fort Adelaide Dock as well as on the single line from Glanville to Semaphore. This latter line was the last remaining single line block telegraph station in Australia and was converted to Single Line Automatic in the financial year 1973-74.

Although no other sections of Winter's block is identified in the Adelaide Division in 1953, other divisions retained the use of the symbol 'B' until its last appearance in Country Passenger Services (20 July 1969).

In a series of articles in Australian Model Railway Magazine there is a brief introduction of block telegraphy. Vol 9, No 9 features a photograph of the instrument at Semaphore.

4. New Zealand

A.W.Cameron (1976) stated that in 1881 there were trials of Dr. Lemon's electric block system at Dunedin. Winter's bloc was also tested in the search for a replacement for Morse key telegraphic interworking. Winter's was found 'rather more satisfactory' and was initially installed between Cross Creek and Summit on the Tullington-Dunsterton line. By 1891 the system had been extended to Upper Mutt. Other sections of block are suggested and in 1902 Featherston had its block replaced by Tyer's Tablet.

Winter and Craik patent semaphores which were provided were released by the smaller switch handle on the block instrument. At a time when most signals were of the slotted pattern on these railways, the patent semaphore was quite unlike the 'counter balanced' arms.

Cameron included the Bell Code for the instruments:-

Step	Instruction	Bell
1.	Will first call attention of corresponding signalman by-	1 Stroke
2.	Corresponding signalman will acknowledge by-	1 Stroke
3.	Signalman when ready to start train will give-	2 Strokes
4.	And on receiving corresponding signalman gives 'Line Clear' by-	3 Strokes
5.	Will then send to corresponding signalman instruction to block-	4 Strokes
6.	Corresponding signalman will then acknowledge by returning 4 Strokes, then turn handle to 'Block'. Train is then started	Showing 'Block on dail'
7.	Corresponding signalman on train passing his office will remove handle from 'Block' and signal 'Line Clear' by	1 Stroke
8.	Other signalman will acknowledge by-	1 Stroke

Since the bell code and the instructions do not include the operation of the Pitt patent (1865) it is likely that this set of instructions relates to the mode of working of the instruments in their earlier pattern.

Cameron has also provided a brief evaluation of the Winter's system. He refers to the 'additional safety factor' provided by the conjoint working by two signalmen as well as the system being 'quite satisfactory for handling the traffic then passing'. It was also remarked that the system gave no trouble.

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Distant Signals at Non-Interlocked Stations

Station	Number	Provided	Abolished
Albion	2	7 April 1927	9 September 1928 §
Broadford	2		11 January 1900 §
Bannockburn	1		20 October 1907 §
Bentleigh	2		15 August 1924 §
Chewton	2		30 January 1968
Collingwood	1	8 May 1888	29 October 1901
Craigieburn	2		3 October 1899 §
Creswick	1		26 March 1913 §
Diggers Rest	2		22 October 1902 §
Drouin	1 up	1 March 1878	
	1 down	16 December 1902	

Station	Number	Provided	Abolished
Echuca	2		
Elaine	2		27 September 1934 §
Epsom Road	1	1 November 1899	31 October 1910 §
Elphinstone	2		22 August 1913 §
Everton	3	7 July 1875	August 1897 (down)
	2 up		5 October 1899 §
Frankston	1		1 December 1910 §
Gisborne	2		1 June 1922 §
Golden Square	2		29 August 1927 §
Guildford	2		
Goornong	2		6 July 1896
Harcourt	2	1899	19 April 1978
Healesville	1		
Highbett	2	7 January 1915	22 August 1924 §
Kangaroo Flat	2		
Kilmore East	2		15 December 1899 §
Lal Lal	2		6 December 1934 §
Leigh Road	1		
Lethbridge	1		
	2		
Lilvdale	2		13 February 1901 §
Macedon	2		18 April 1913 §
Malmsbury	2		10 January 1979
Meredith	1		
	2		
Medina	1	10 July 1910	3 February 1924
Cattle Siding (North Bendigo)	1 1		
Newstead	1 up	13 March 1911	
North Carlton	2	3 November 1888	30 October 1916 §
North Essendon	1 down		15 November 1965
Noble Park	2	13 February 1922	13 October 1947 §
Ormond	2	1 November 1915	1 March 1923 §
Pyalong	2		15 November 1906
Pascoe Vale	1	7 September 1914	15 September 1929 §
Parkers Road	2	23 December 1911	16 September 1919 §
Ravenswood	2		
Riddells Creek	2		29 September 1927 §
Sandown Park	2		1 November 1911 §
Springvale	2		1 September 1902 §
St Albans	2		17 June 1901 §
Stratford	1		26 April 1919
Sunbury	2		22 October 1885 §
Sydenham	2		22 October 1909 §
Somerton	2	18 April 1904	14 August 1905
Taradale	2		1 July 1953
Tooborac	2		
	1		23 November 1906
Toolamba	3		15 July 1890 §
Tunstall	2		13 November 1960
Tottenham	2	17 July 1911	23 April 1912 §
Wandong	2		7 August 1900 §
Warrnambool	1 up	WN18/1912	23 June 1968
Wildwoods	2	17 July 1912	
Winchelsea	2		WN43/1917
Yendon	2		9 October 1934

If you can fill in any gaps in the above, please write to the Editor, it would be good to hear from someone other than Graeme Reynolds this year!